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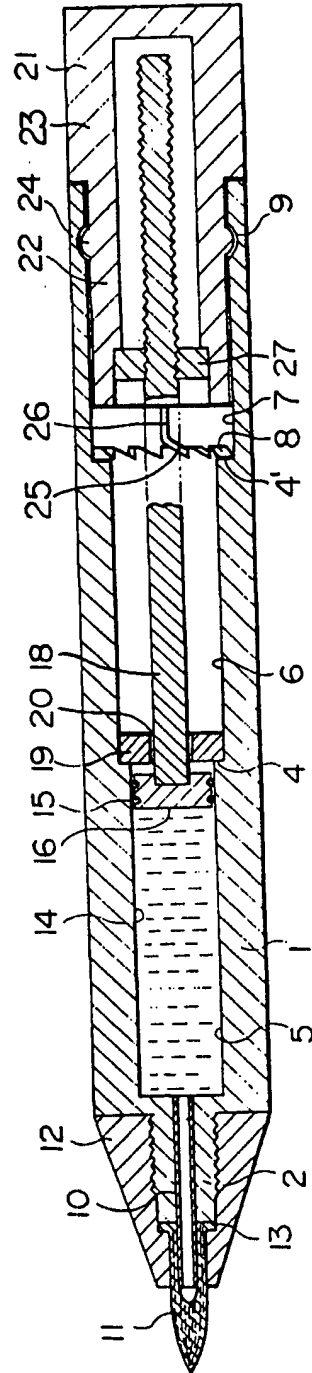
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LIQUID APPLICATOR

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5 The present invention relates to a liquid applica-
tor such as: cosmetic instruments employing cosmetic
liquid such as an eyeliner, mascara, nail polish and
the like; writing instruments employing ink such as a
10 marking pen, felt-tipped pen and the like; and other
applicator for applying other application liquid, and
more particularly to a liquid applicator which forcibly
feeds the application liquid to a liquid-application por-
tion of the instrument.

15 Hitherto, there has been provided a liquid appli-
cator in which: a reservoir portion for receiving the
application liquid therein is provided in the interior
of a shaft sleeve of the applicator, the reservoir portion
communicating with the liquid-application portion of
20 the applicator; an axially-movable member such as a piston
is mounted in the reservoir portion of the applicator;
a rotary control member is provided in a rear-end portion
of the shaft sleeve of the applicator, and rotatably
driven to move the axially-movable member such as the
25 piston forward in a screw-driving manner so that the

1 application liquid is forcibly fed to the liquid-
application portion from the reservoir portion of the
applicator. Such conventional liquid applicator is dis-
closed in, for example, Japanese Utility Model Publication
5 No. 50-10925.

In such conventional liquid applicator, however,
in case that it is necessary to keep a feed rate of the
application liquid at a certain level, namely, in case
that the axially-movable member such as the piston of
10 the applicator is advanced at a certain rate, it is neces-
sary to precisely control the rotary control member of
the applicator in its rotation. However, it is very cum-
bersome for the user to precisely control the rotary
control member of the applicator even when a graduated
15 scale is provided in a rotary knob of the rotary control
member of the applicator, because the reading of such
scale makes the user tired and leads to misreading. Such
misreading often causes the rotary control member to
be reversely rotated so that air is sucked into the reser-
20 voir portion of the applicator and expanded when the
temperature of the applicator increases. Such expansion
of the air in the reservoir portion causes the application
liquid to drop from the liquid-application member of
the applicator. These are problems inherent in the conven-
25 tional liquid applicator. Therefore,

the present invention provides a novel liquid applicator which may resolve the above problems.

According to the present invention, there is provided a liquid applicator comprising: a tubular shaft sleeve; a liquid application member at a front-end portion of said shaft sleeve; a liquid reservoir portion communicating with said liquid-application member, said reservoir portion being provided in said shaft sleeve; a piston in said reservoir portion so as to be axially slidable while in sealing contact with said reservoir portion; a threaded rod connected to said piston, said threaded rod being provided with a male screw portion at least at its rear portion; means for preventing said threaded rod from rotating; a rotary control sleeve rotatably mounted at a rear-end portion of said shaft sleeve, said rotary control sleeve being prevented from moving in an axial direction of said shaft sleeve, and having at least one resiliently-deformable engaging projection at its front end; a driving means for driving said threaded rod, said driving means being provided in said rotary control sleeve; and a concavo-convex portion on an inner wall of said shaft sleeve, said concavo-convex portion engaging with said resiliently-deformable engaging projection so that relative movement between the concavo-convex portion and the projection can take place in a single direction only.

It is preferable that said concavo-convex portion of said shaft sleeve consists of perpendicular walls extending substantially parallel to a longitudinal axis of said shaft sleeve and oblique walls extending from said perpendicular walls at an acute angle, said perpendicular walls being spaced alternately with said oblique walls.

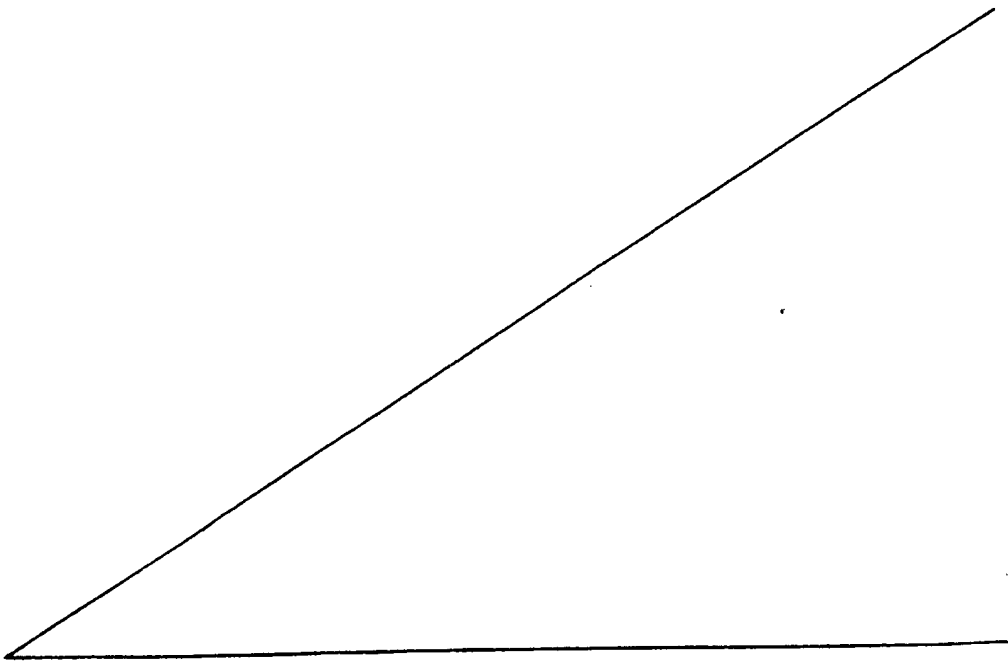
The driving means for driving the threaded rod may comprise a threaded hole in said rotary control sleeve, said threaded hole being a through-hole. Alternatively, the driving means may comprise a separate member having a female screw which is threadably engaged with said male screw of said threaded rod, said separate member being fixedly mounted inside said rotary control sleeve.

A plurality of the resiliently-deformable engaging projections may be provided at said front end of said rotary control sleeve.

The liquid applicator may be a writing or painting instrument or a cosmetics applicator.

The invention will now be described by way of non-limiting example with reference to the accompanying drawing.

The drawing shows a longitudinal sectional view of an embodiment of the liquid applicator of the present invention.



As shown in the drawing, the reference numeral 1 denotes a tubular shaft sleeve of the liquid applicator of the present invention. In a front-end portion of the shaft sleeve 1 of the applicator, there is provided a small-diameter projection 2 to a front-end portion of which is connected a brush tip 11 which is provided with a rear-end flange 13 in its base portion. A front shaft 12 is threadably connected to the small-diameter projection 2 of the shaft sleeve 1 through the rear-end flange 13 of the brush tip 11 so as to fix the brush tip 11 to the shaft sleeve 1.

The reference numeral 10 denotes a liquid conduit through which a liquid reservoir portion 14 of the shaft sleeve for receiving an application liquid therein communicates with the brush tip 11. The liquid conduit 10 is fixedly mounted in a bore portion of the small-diameter projection 2 of the shaft sleeve 1 _____ so that a front-end portion of the liquid conduit 10 projects outward from the front end of the small-diameter

1 projection 2 of the shaft sleeve 1 to enter the interior
of the brush tip 11 at its front-end portion.

5 The brush tip 11 communicates with the liquid
reservoir portion 14 of the shaft sleeve 1 through such
liquid conduit 10, so that the application liquid is
fed to the brush tip 11 from the liquid reservoir portion
14 of the shaft sleeve 1 through the liquid conduit 10.

10 The interior of the tubular shaft sleeve 1 in-
creases stepwise in its inner diameter to form: a first
interior part forming the bore of the small-diameter
projection 2; a second interior part 5 which is positioned
behind the first interior part and larger in diameter
than the first interior part or the bore of the small-
diameter projection 2, and forms the liquid reservoir
15 portion 14 of the shaft sleeve 1; a third interior part
6 which is positioned behind the second interior part
5 and larger in diameter than the second interior part;
and a fourth interior part 7 which is positioned behind
the third interior part 6 and larger than the third inte-
rior part 6. Shoulder portions 4 and 4' are formed in
20 a position between the second 5 and the third 6 interior
parts and in a position between the third 6 and the fourth
7 interior parts, respectively.

25 A saw-toothed concavo-convex portion 8 is provided
in the shoulder portion 4 of the shaft sleeve 1, and

1 consists of: vertical walls extending substantially paral-
lel to a longitudinal axis of the shaft sleeve 1; and
oblique walls obliquing from the vertical walls at an
acute angle, the vertical walls being spaced alternately
5 with the oblique walls.

A groove 9 is provided in an inner wall of the
shaft sleeve 1 at a position near the rear end of shaft
sleeve 1 to extend in a circumferential direction of
the inner wall of the shaft sleeve 1.

10 A piston 16 is axially slidably inserted into
the liquid reservoir portion 14 of the shaft sleeve 1.
The application liquid is received in the liquid reservoir
portion 14 at a position in front of the piston 16.
O-rings 15 are mounted on an outer peripheral surface
15 of the piston 16 so that the piston 16 is brought into
a sealing contact with an inner surface of the liquid
reservoir portion 14 through the O-rings 15 to prevent
the application liquid from leaking from the liquid reser-
voir portion 14. It is possible to replace the O-rings
20 15 with any other suitable means for preventing the appli-
cation liquid from leaking from the liquid reservoir
portion 14.

A threaded rod 18 is fixed to a rear side of
the piston 16, and passes through the third interior
25 part 6 of the shaft sleeve 1 to enter the fourth interior

1 part 7 of the shaft sleeve 1. A rear-half portion of
the threaded rod 18 forms a male screw, while a front-half
portion of the threaded rod 18 is not threaded to form
a square-column portion.

5 It is possible that the threaded rod 18 assumes
a square-column shape as a whole. In this case, longitudinal
edges of such square-column-shaped rod 18 is threaded.

It is also possible that the threaded rod 18
assumes a circular-column shape as a whole.

10 The reference numeral 19 denotes a stopper means
for preventing the threaded rod 18 from rotating about
its longitudinal axis, provided that the stopper means
19 permits the threaded rod 18 to move axially relative
to the shaft sleeve 1.

15 The stopper means 19 is provided with a central
hole 20 a shape of which corresponds to that of the cross
section of the front-half portion of the threaded rod
18, so that the threaded rod 18 is slidably inserted
into the central hole 20 of the stopper means 19. Conse-
20 quently, it is possible for the threaded rod 18 to axially
move relative to the stopper means 19, but not possible
to rotate about its longitudinal axis. In case that
the threaded rod 18 assumes a circular-column shape as
a whole, another stopper means is required. For example,
25 a ridge extending in a longitudinal direction of the

1 shaft sleeve 1 is integrally formed in an outer peripheral
surface of such threaded rod 18 to provide such another
stopper means, provided that the central hole 20 assumes
a shape corresponding to a cross section of such threaded
5 rod 18 having the ridge.

The reference numeral 21 denotes a rotary control
sleeve a front-half portion 22 of which is rotatably
mounted in the fourth interior part 7 of the shaft sleeve
1. An outer diameter of the front-half portion 22 of
10 the rotary control sleeve 21 is slightly smaller than
the inner diameter of the fourth interior part 7 of the
shaft sleeve 1 to make it possible that the front-half
portion 22 of the rotary control sleeve 21 fits in the
fourth interior part 7 of the shaft sleeve 1. An outer
15 diameter of a rear-half portion 23 of the rotary control
sleeve 21 is substantially corresponding to the outer
diameter of the rear-end portion of the shaft sleeve
1.

An annular ridge 24 corresponding to the groove
20 9 of the shaft sleeve 1 is provided in the outer peripheral
surface of the front-half portion 22 of the rotary
control sleeve 21 at a position corresponding to that
of groove 9 when the rotary control sleeve 21 is mounted
in the fourth interior part 7 of the shaft sleeve 1.
25 Such ridge 24 of the rotary control sleeve 21 engages

1 with the groove 9 of the shaft sleeve 1 so that the rotary
control sleeve 21 is rotatably mounted in the rear-end
portion of the shaft sleeve 1, while prevented from moving
axially.

5 A resiliently-deformable engaging piece 26 pro-
vided with a hook 25 at its front-end portion is provided
in a front-end surface of the rotary control sleeve 21
in a projecting manner. Although the number of such engag-
ing piece 26 is one in the embodiment of the present
10 invention as shown in the drawing, it is also possible
to provide a plurality of the engaging pieces 26 in the
front-end surface of the rotary control sleeve 21. The
length of the of the engaging piece 26 is so adjusted
that the hook 25 of the engaging piece 26 reaches the
15 concavo-convex portion 8 of the shoulder portion 4' of
the shaft sleeve 1 to engage therewith in case that the
rotary control sleeve 21 is mounted in the rear-end por-
tion of the shaft sleeve 1. In this case, the hook 25
of the engaging piece 26 is curved to fit the oblique
20 wall of the concavo-convex portion 8 of the shoulder
portion 4' of the shaft sleeve 1. Since the hook 25 of
the engaging piece 26 is resiliently deformed to pass
the oblique wall of the concavo-convex portion 8 of the
shaft sleeve 1, the rotary control sleeve 21 can rotate
25 counterclockwise in a rear-end view of the embodiment

1 of the liquid applicator of the present invention shown
in the drawing. In other words, the rotary control sleeve
21 is prevented from rotating clockwise because the hook
25 of the engaging piece 26 abuts on the vertical wall
5 of the concavo-convex portion 8 to act as a detent.

Inside the rotary control sleeve 21 is provided
a driving member 27 which is fixedly mounted in the rotary
control sleeve 21 while provided with a female screw
in its central portion, which female screw is threadably
10 engaged with the threaded portion of the threaded rod
18. The driving member 27 may be fixed to the rotary
control sleeve 21 by means of a suitable means. It is
also possible to replace such separate driving means
27 with a threaded hole formed in the rotary control
15 sleeve 21.

The threaded portion or a male screw portion
of the threaded rod 18 is threadably engaged with the
female screw of the driving member 27 and moves the
threaded rod 18 forward when the rotary control sleeve
20 21 is rotated by the user in the single direction men-
tioned above.

The threaded rod 18 has a sufficient length so
that it is possible to move the piston 16 to the foremost
position of the liquid reservoir portion 14 of the shaft
25 sleeve 1.

1 The above components of the liquid applicator
of the present invention may be made of conventional
materials. It is also possible to cover the brush tip
11 with a cap (not shown) in order to protect the brush
5 tip 11 from damage.

 In operation, the rotary control sleeve 21 is
rotated by the user so that the piston 16 is moved forward
by the threaded rod 18. Under such circumstances, since
the rotary control sleeve 21 is kept stationary in the
10 axial direction of the shaft sleeve 1, the hook 25 of
the engaging piece 26 produces a click at each time when
the hook 25 passes the oblique wall of the concavo-convex
portion 8 of the shaft sleeve 1. In use, it is possible
for the user to sense the thus produced click in hearing
15 and feeling. Consequently, it is very easy for the user
to control the rotary control sleeve 21 in feeding the
application liquid to the brush tip 11 from the liquid
reservoir portion 14 by the use of the piston 16.

 In this case, since there is no fear that the
20 rotary control sleeve 21 is reversely rotated, there
is no fear that the piston is moved rearward to cause
the air to enter the liquid reservoir portion 14 of the
shaft sleeve 1.

CLAIMS

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1. A liquid applicator comprising: a tubular shaft sleeve; a liquid-
application member at a front-end portion of said shaft sleeve; a liquid
5 reservoir portion communicating with said liquid-application member, said
reservoir portion being provided in said shaft sleeve; a piston in said
reservoir portion so as to be axially slidable while in sealing contact with
said reservoir portion; a threaded rod connected to said piston, said
10 threaded rod being provided with a male screw portion at least at its rear
portion; means for preventing said threaded rod from rotating; a rotary
control sleeve rotatably mounted at a rear-end portion of said shaft
sleeve, said rotary control sleeve being prevented from moving in an axial
direction of said shaft sleeve, and having at least one resiliently-
deformable engaging projection at its front end; a driving means for
15 driving said threaded rod, said driving means being provided in said rotary
control sleeve; and a concavo-convex portion on an inner wall of said
shaft sleeve, said concavo-convex portion engaging with said resiliently-
deformable engaging projection so that relative movement between the
concavo-convex portion and the projection can take place in a single
20 direction only.

2. A liquid applicator according to claim 1, wherein: said
concavo-convex portion of said shaft sleeve consists of perpendicular
walls extending substantially parallel to a longitudinal axis of said shaft

sleeve and oblique walls extending from said perpendicular walls at an acute angle, said perpendicular walls being spaced alternately with said oblique walls.

3. A liquid applicator according to either of claims 1 and 2, wherein: said driving means for driving said threaded rod comprises a threaded hole in said rotary control sleeve, said threaded hole being a through-hole.
 4. A liquid applicator according to either of claims 1 and 2, wherein: said driving means for driving said threaded rod comprises a separate member having a female screw which is threadably engaged with said male screw of said threaded rod, said separate member being fixedly mounted inside said rotary control sleeve.
 5. A liquid applicator according to any preceding claim, wherein: a plurality of said resiliently-deformable engaging projections are provided at said front end of said rotary control sleeve.
 6. A liquid applicator according to any preceding claim in the form of a writing or painting instrument or a cosmetics applicator.
 7. A liquid applicator according to any preceding claim substantially as herein described.
 8. A liquid applicator substantially as herein described with reference to the accompanying drawing.
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